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IS 2628-2 (1967): Rotary wafer switches (Low current rating): Part 2 Rotary wafer switches with central mounting [LITD 3: Electromechanical Components and Mechanical Structures for Electronic Equipment]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 2628 (Part II) - 1967

Indian Standard

**SPECIFICATION FOR ROTARY WAFER
SWITCHES (LOW CURRENT RATING)**

**PART II ROTARY WAFER SWITCHES
WITH CENTRAL MOUNTING**

(First Reprint JUNE 1982)

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Indian Standard

SPECIFICATION FOR ROTARY WAFER SWITCHES (LOW CURRENT RATING)

PART II ROTARY WAFER SWITCHES WITH CENTRAL MOUNTING

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Indian Standard

SPECIFICATION FOR ROTARY WAFER SWITCHES (LOW CURRENT RATING)

PART II ROTARY WAFER SWITCHES WITH CENTRAL MOUNTING

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 2 March 1967, after the draft finalized by the Electromechanical Components for Electronic Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard which forms Part II of IS : 2628 covers the requirements for rotary wafer switches with central mounting, including the dimensional requirements.

0.3 This standard requires reference to IS : 2628(Part I)-1964* in which details of general requirements and tests have been fully covered. Only the relevant requirements and other special conditions have been included in this standard.

0.4 It is necessary in the case of components like rotary wafer switches to specify complete details including dimensions, design of indexing mechanisms, number of wafers, etc, so that the equipment designer may order and obtain his exact requirements. It is possible to have any number of types of switches to meet specified circuit requirements. This standard covers one such type and other parts laying down detailed specifications for other types of rotary wafer switches are to be issued in due course.

0.5 A series of Indian Standards on rotary wafer switches has been established with the object of specifying uniform requirements for the electrical, mechanical and climatic properties as well as safety aspects, test methods and dimensional details to ensure interchangeability and compatibility of rotary wafer switches generally used in electronic and telecommunication equipment.

0.6 Only dimensions required from the point of view of interchangeability have been standardized. Other indicated dimensions and contact arrangements in Fig. 1 or Fig. 2 which depend on individual circuit requirements, should be specified by the purchaser.

*Specification for rotary wafer switches (low current rating) : Part I Tests and general requirements.

IS : 2628 (Part II) - 1967

0.7 This standard is one of a series of Indian Standards on electromechanical components for electronic equipment.

0.8 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part II) covers the requirements, including the dimensional requirements, for rotary wafer switches (low current rating) with central mounting used in electronic and telecommunication equipment.

1.1.1 Rotary wafer switches with normal-duty and heavy-duty index mechanisms are covered in this specification.

NOTE — The terms 'normal-duty' and 'heavy-duty' bear no relationship to the electrical rating of the switches but indicate the difference in the operating torque.

2. TERMINOLOGY

2.0 For the purposes of this standard, the definitions of terms given in 2 of IS : 2628 (Part I)-1964† shall apply.

3. TYPE DESIGNATION

3.1 Rotary wafer switches conforming to this standard shall be designated by:

- a) the indication of type of switch, namely, Type 1 to indicate the switches having wafers of maximum size 50 mm conforming to Fig. 1, and Type 2 to indicate switches having wafers of maximum size 37 mm conforming to Fig. 2;
- b) the applicable climatic category; and
- c) the grade of the switch.

4. GRADES

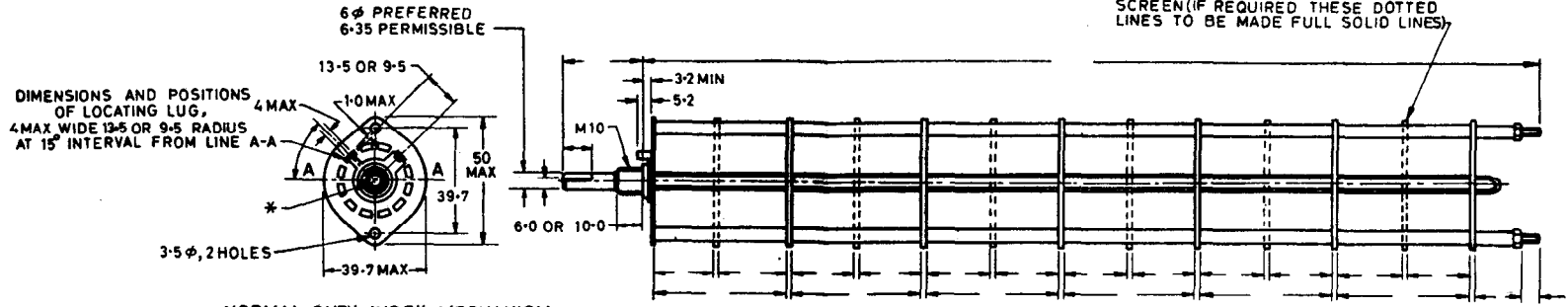
4.1 The provisions of 3.1 of IS : 2628 (Part I)-1964† shall apply.

5. CLIMATIC SEVERITIES

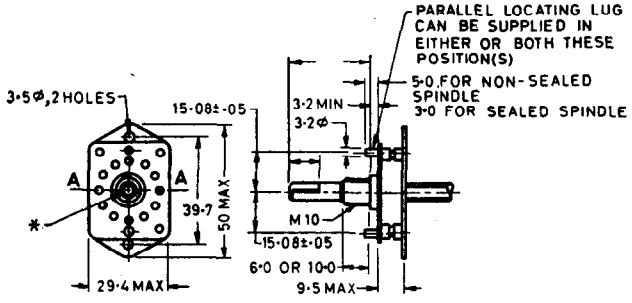
5.1 The provisions of 3.2 of IS : 2628 (Part I)-1964† shall apply.

*Rules for rounding off numerical values (revised).

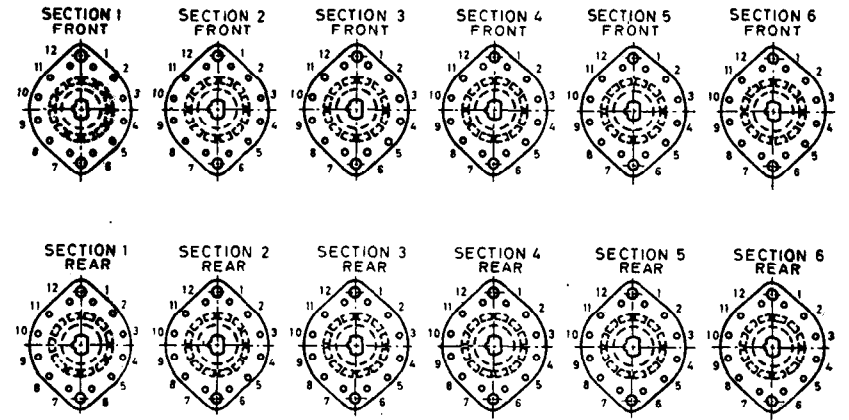
†Specification for rotary wafer switches (low current rating) : Part I Tests and general requirements.



NORMAL DUTY INDEX MECHANISM
INDEX THROW 30°/60°



HEAVY DUTY INDEX MECHANISM
INDEX THROW 30°/60°

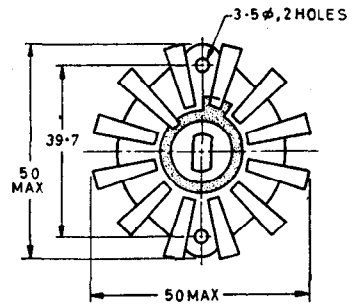


FRONT AND REAR OF SECTIONS VIEWED FROM FRONT OR KNOB
END OF SWITCH IN EXTREME COUNTER-CLOCKWISE POSITION

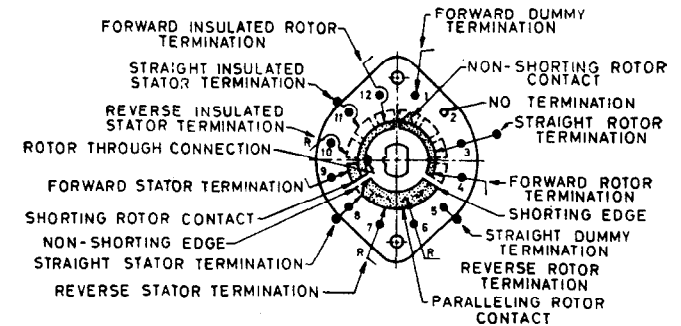
NOTES:-

OTHER INDICATED DIMENSIONS AND CONTACT ARRANGEMENTS WHICH DEPEND ON INDIVIDUAL CIRCUIT REQUIREMENTS, SHOULD BE SPECIFIED BY THE PURCHASER

* DRAW IN FLAT IF REQUIRED ON ABOVE SHAFT IN EXTREME COUNTER-CLOCKWISE POSITION AND SHOW ANGLE WITH REFERENCE TO LINE A-A



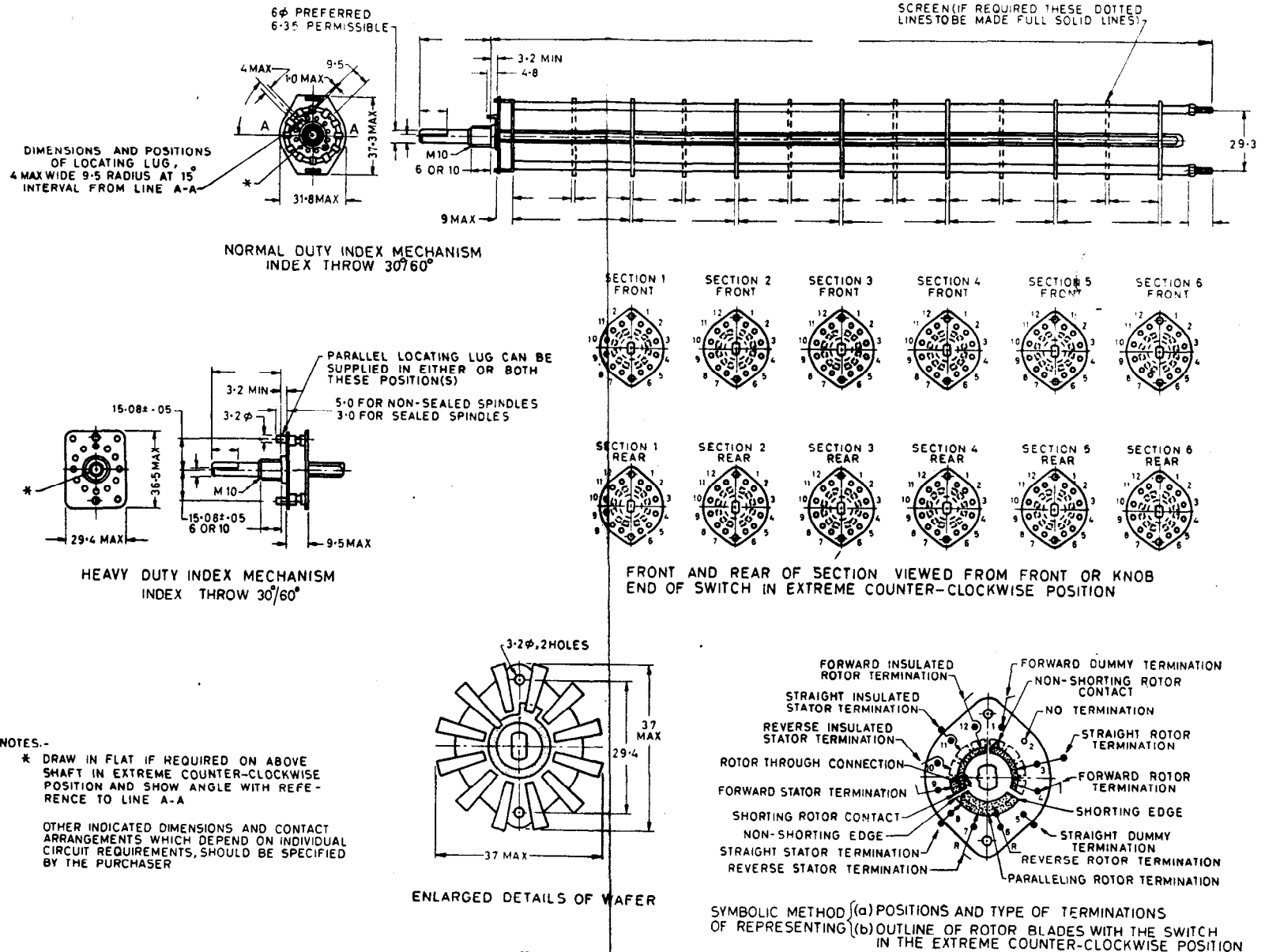
ENLARGED DETAILS OF WAFER



SYMBOLIC METHOD (a) POSITIONS AND TYPE OF TERMINATIONS
(b) OUTLINE OF ROTOR BLADES WITH THE SWITCH IN THE EXTREME COUNTER-CLOCKWISE POSITION

All dimensions in millimetres.

FIG. 1 ROTARY WAFER SWITCHES, SIZE 50



All dimensions in millimetres.
FIG. 2 ROTARY WAFER SWITCHES, SIZE 37

6. DIMENSIONS

6.1 Dimensions — The rotary wafer switches shall conform to the dimensions specified in Fig. 1 or Fig. 2. Fig. 1 refers to rotary wafer switches of size 50 mm and Fig. 2 to rotary wafer switches of size 37 mm.

NOTE — Only dimensions required from the point of view of interchangeability have been standardized. Other indicated dimensions which depend on individual circuit requirements, should be specified by the purchaser.

7. MATERIALS, CONSTRUCTION AND WORKMANSHIP

7.1 The provisions of 5.1 of IS : 2628 (Part I)-1964* shall apply.

8. ELECTRICAL RATINGS

8.1 Recommended combinations of voltage and current, and their associated circuit conditions under which the switch contact shall operate satisfactorily at standard atmospheric conditions are given in Table 1.

TABLE 1 ELECTRICAL RATINGS

CURRENT	VOLTAGE	CIRCUIT CONDITION
mA	V	
50	300 } 30 }	dc resistive circuit
500		
50	350 peak	ac inductive circuit, power factor 0.7 to 0.8 and frequency $f = 40$ to 60 c/s

NOTE — When these switches are not required to make or break a circuit whilst the current is flowing, the current rating may be increased to 2A.

9. MARKING

9.1 The provisions of 6 of IS : 2628 (Part I)-1964*, shall apply.

10. TEST SCHEDULE

10.1 General — This test schedule specifies all tests and the order in which they shall be carried out as well as the requirements to be met with.

10.2 Classification of Tests — The provisions of 13 of IS : 2628 (Part I)-1964* shall apply except for the modifications specified in 10.2.1 for type approval tests.

*Specification for rotary wafer switches (low current rating) : Part I Tests and general requirements.

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10.2.1 Details of Samples — Three specimens of each category and grade shall have 6 or more wafers, the remainder need have only 2 wafers having a full set of contacts. The selected samples shall be representative of shorting and non-shorting contacts; double-sided wafers and eyelet insulators.

10.3 Conditions for Tests — The provisions of 7 of IS : 2628 (Part I)-1964* shall apply.

10.4 Test Schedule — The test schedule shall be as specified in Table 2.

NOTE 1 — The clause reference, conditions of tests and test requirements specified are applicable for the acceptance tests also and the grouping into lots, is for the purposes of the type tests only.

NOTE 2 — Conditions of tests and values for the requirements that are to be specified according to IS : 2628 (Part I)-1964* only are given in columns 4 to 6 of Table 2. Other conditions and requirements are according to IS : 2628 (Part I)-1964*.

11. ORDER FORM

11.1 In the case of components like rotary wafer switches it is necessary for the purchaser to specify complete design details (including dimensions, design of indexing mechanisms, number of wafers, etc,) which affect their use and interchangeability and to specify means for identification of specific switches.

11.1.1 When ordering rotary wafer switches according to this standard the Fig. 1 and 2 in which are specified dimensions required for interchangeability, should be completed by the purchaser with respect to other dimensions as well as the contact arrangement.

11.2 Contact Arrangement — The system indicated in Table 3 on P 19 is recommended for the contact arrangement for a single-, double-, three- and four-pole switches.

11.3 Dimensions — The blank dimensions in the figures shall be filled in considering the values for spacers, shield screening, etc, specified in **11.3.1** to **11.3.3**, taking into account the appropriate spacing between and thickness of wafers where applicable. Where shield screenings are required the dotted lines shall be made into solid lines. Necessary details of spindle ends for fixing of knobs or for coupling shall be indicated as specified in Fig. 1 and 2.

11.3.1 Spacers — lengths 1.5, 3, 6, 9.5, 12.5, 25 and 50 mm are recommended.

11.3.2 Shield Screening — These shall be 1 mm thick.

*Specification wafer switches (low current rating): Part I Tests and general requirements.

11.3.3 Minimum Spacing of Wafers — Minimum spacing of wafers shall be as specified below:

- a) Minimum spacing between front plate and first section:
8 mm with terminations to rear of first section, and
9.5 mm with terminations facing front.
- b) Minimum spacing of section:
3.2 mm when terminations face away from each other,
8 mm when terminations face in same direction as adjoining sections, and
14.3 mm when terminations of both sections face towards each other.
- c) Minimum spacing between wafers and the screen:
Terminations towards screen 9.5 mm, and
Terminations away from screen 2.4 mm.

11.4 Other Details to be Specified at the Time of Ordering — The purchaser shall furnish the details as given below while ordering:

Sl No.	<i>Other Details to be Specified at the Time of Ordering</i>		<i>Any Other Special Requirements</i>
	<i>Item</i>	<i>Delete words not required</i>	
i)	Category	I, II, III	
ii)	Wafer contour	Plain, Castellated	
iii)	Switch (wafer) grade	Grade 1, Grade 2	
iv)	Index mechanism	Normal duty, Heavy duty	
v)	Index throw	30°, 60°	
vi)	No. of positions		
vii)	Total No. of wafer sections		
viii)	Spindle	Sealed, Non-sealed	
ix)	Bearing strap	Required, Not required	

TABLE 2 TEST SCHEDULE*

(Clause 10.4)

TEST	CLAUSE OF IS : 2628 (PART I) - 1964†	CONDITIONS OF TESTS	TEST REQUIREMENTS				
			Category I	Category II	Category III		
(1)	(2)	(3)	(4)	(5)	(6)		
<i>All Samples</i>							
Visual examination	8.1		According to cl 6 and Fig. 1 and 2				
Dimensions	8.2						
Contact resistance	9.1		10 mΩ, Max	10 mΩ, Max	10 mΩ, Max		
Insulation resistance	9.2	Test voltage 500 ± 50 V	Grade I		Grade II		
			Insulation resistance between parts specified in the following clauses of IS : 2628 (Part I) - 1964†				
			9.2.2 (a) 10 000 MΩ, Min				1 000 MΩ, Min
			9.2.2 (b) 10 000 MΩ, Min				5 000 MΩ, Min
Voltage proof	9.3	Test voltage 1 050 V (peak)					
Capacitance	9.5	At 1 Mc/s	Grade I		Grade II		
			Capacitance between parts as specified in the following clauses of IS : 2628 (Part I) - 1964 †				
			9.5.2 (a) } Under consideration				10 pF, Max
			9.5.2 (b) }				10 " "
			9.5.2 (c) }				10 " "
			9.5.2 (d) }				10 " "
9.5.2 (e) }				Not applicable			
Sealing, normal (for sealed type only)	11.9.1		The rate of leakage shall not exceed 1 ml per hour.				

The switches shall then be divided into five lots and all switches in each lot shall undergo the tests specified for each lot [see Appendix A of IS : 2628 (Part I)-1964*].

First Lot

Rotational torque 10.1

For heavy duty types:

3 kgf.cm, *Min*

6.5 kgf.cm, *Max*

For normal duty types:

1.5 kgf.cm, *Min*

4.5 kgf.cm, *Max*

End stop torque 10.2

Torque 17 kgf.cm

Index mechanism 10.3

Heavy duty index mechanism:

The switch shall fall into any contact position when placed within a range of 12° from that position.

Normal duty index mechanism:

The switch shall fall into any contact position when placed within a range of 5° from that position.

II

Robustness of terminations 10.4

a) Tensile test 10.4.1

Load 1 kg

b) Bending test 10.4.2

2 Bends

Soldering 10.5

Method 2 of 7.18 of IS : 589-1961†
Size of bit 8 mm
Period of recovery 30 minutes

Vibration 10.6

Severity III (see Table 1 of IS : 589-1961†)

Contact resistance after vibration 10.6.4

10 mΩ, *Max*

10 mΩ, *Max*

10 mΩ, *Max*

*For sequence of type tests, see Appendix A of IS : 2628 (Part I)-1964.

†Specification for rotary wafer switches (low current rating) : Part I Tests and general requirements.

‡Basic climatic and mechanical durability tests for electronic components.

(Continued)

TABLE 2 TEST SCHEDULE — *Contd*

TEST	CLAUSE OF IS : 2628 (PART I) - 1964*	CONDITIONS OF TESTS	TEST REQUIREMENTS		
			Category I	Category II	Category III
(1)	(2)	(3)	(4)	(5)	(6)
<i>First Lot (Contd)</i>					
Bumping	10.7				
Contact resistance after bump test			10 mΩ, Max	10 mΩ, Max	10 mΩ, Max
Rapid change of temperature (applicable to category I and II only)	11.8	Extreme temperatures of the appropriate temperature range			
Contact resistance	11.8.4		10 mΩ, Max	10 mΩ, Max	Not applicable
			Grade I		Grade II
Insulation resistance	11.8.4	Test voltage 500 ± 50 V	Insulation resistance between parts specified in the following clauses of IS : 2628 (Part I) - 1964*		
			9.2.2 (a) 10 000 MΩ, Min		1 000 MΩ, Min
			9.2.2 (b) 10 000 MΩ, Min		5 000 MΩ, Min
Voltage proof	11.8.4	Test voltage 1 050 V (peak)			
RF shunt resistance (for grade I switches only)	11.8.4	Measured at 10 Mc/s between two terminations not connected together		Not less than 1.5 MΩ	

			Grade I	Grade II
Capacitance	11.8.4	At 1 Mc/s	Capacitance between parts as specified in the following clauses of IS : 2628 (Part I)-1964*	
			9.5.2 (a) } 9.5.2 (b) } 9.5.2 (c) } Under consideration 9.5.2 (d) } 9.5.2 (e) }	a) 10 pF, <i>Max</i> b) 10 " " c) 10 " " d) 10 " " e) Not applicable
Rotational torque	11.8.4		For heavy duty types : 3 kgf.cm, <i>Min</i> 6.5 kgf.cm, <i>Max</i> For normal duty types : 1.5 kgf.cm, <i>Min</i> 4.5 kgf.cm, <i>Max</i>	
Sealing, normal (for sealed types only)	11.9.1		The rate of leakage shall not exceed 1 ml per hour	
Dust	11.12	(Dust test is under consideration)		
<i>Second Lot</i>				
Climatic sequence	11			
Dry heat	11.2	Maximum category temperature		
			Grade I	Grade II
Insulation resistance at high temperature	11.2.2	Test voltage: 500 ± 50V	Insulation resistance between parts as specified in the following clauses of IS : 2628 (Part I)-1964*	
			9.2.2 (a) 10 000 MΩ, <i>Min</i> 9.2.2 (b) 10 000 MΩ, <i>Min</i>	500 MΩ, <i>Min</i> 2 500 MΩ, <i>Min</i>
Damp heat accelerated first cycle	11.3	One cycle		
Cold	11.4	Minimum category temperature		

*Specification for rotary wafer switches (low current rating) : Part I Tests and general requirements.

(Continued)

TABLE 2 TEST SCHEDULE — *Contd*

TEST	CLAUSE OF IS : 2628 (PART I)- 1964*	CONDITIONS OF TESTS	TEST REQUIREMENTS		
			Category I	Category II	Category III
(1)	(2)	(3)	(4)	(5)	(6)
<i>Second Lot (Contd)</i>					
Rotational torque at low temper- ature	11.4.4		For heavy duty types: 3 kgf.cm, <i>Min</i> 8 kgf.cm, <i>Max</i> For normal duty types: 1.5 kgf.cm, <i>Min</i> 6 kgf.cm, <i>Max</i>		
			Grade I Grade II		
Capacitance	11.4.5	1 Mc/s	Capacitance between parts as specified in the following clauses of IS : 2628 (Part I)-1964*		
			9.5.2 (a) } 9.5.2 (b) } 9.5.2 (c) } 9.5.2 (d) } 9.5.2 (e) }	Under consideration	10 pF, Max 10 " " 10 " " 10 " " Not applicable
Radio frequency shunt resistance (for Grade I switches only)	11.4.6	Measured at 10 Mc/s between two termina- tions not connected together	Not less than 1.5 MΩ		
Low air pressure	11.5				
Damp heat (acce- lerated) remain- ing cycles	11.6				

Contact resistance	11.6.3		10 m Ω , <i>Max</i>	10 m Ω , <i>Max</i>	10 m Ω , <i>Max</i>
			Grade I		Grade II
Insulation resistance	11.6.3	Test voltage: 500 \pm 50 V	Insulation resistance between parts specified in the following clauses of IS: 2628 (Part I)-1964*		
			9.2.2 (a) 10 000 M Ω <i>Min</i>		10 M Ω , <i>Min</i>
			9.2.2 (b) 10 000 M Ω , <i>Min</i>		1 000 M Ω , <i>Min</i>
Voltage proof	11.6.3	Test voltage 1 050 V (peak)			
Radio frequency shunt resistance (for Grade I switches only)	11.6.3	Measured at 10 Mc/s between two terminations not connected together		Not less than 1.5 M Ω	
			Grade I		Grade II
Capacitance	11.6.3	At 1 Mc/s	Capacitance between parts as specified in the following clauses of IS : 2628 (Part I)-1964*		
			9.5.2 (a) } 9.5.2 (b) } 9.5.2 (c) } 9.5.2 (d) } 9.5.2 (e) }	Under consideration	10 pF, <i>Max</i> 10 " " 10 " " 10 " " Not applica- ble
Rotational torque	11.6.3	—		For heavy duty types: 3 kgf.cm, <i>Min</i> 6.5 kgf.cm, <i>Max</i> For normal duty types: 1.5 kgf.cm, <i>Min</i> 4.5 kgf.cm, <i>Max</i>	

*Specification for rotary wafer switches (low current rating) : Part I Tests and general requirements.

(Continued)

TABLE 2 TEST SCHEDULE — *Contd*

TEST (1)	CLAUSE OF IS : 2628 (PART I) - 1964* (2)	CONDITIONS OF TESTS (3)	TEST REQUIREMENTS		
			Category I (4)	Category II (5)	Category III (6)
<i>Second Lot (Contd)</i>					
Insulation resis- tance after 24 hours recovery	11.6.4		Grade I		Grade II
			Insulation resistance between parts specified in the following clauses of IS : 2628 (Part I) - 1964*		
			9.2.2 (a) 10 000 M Ω , <i>Min</i>		100 M Ω , <i>Min</i>
			9.2.2 (b) 10 000 M Ω , <i>Min</i>		1 000 M Ω , <i>Min</i>
			Rate of leakage shall not exceed 1 ml per hour		
Sealing normal (for sealed type only)	11.9.1				
Salt mist	11.10				
Visual examina- tion	8.1				
<i>Third Lot</i>					
Damp heat, long term	11.7				
Contact resistance	11.7.4		10 m Ω , <i>Max</i>	10 m Ω , <i>Max</i>	10 m Ω , <i>Max</i>
Insulation resistance	11.7.4	Test voltage 500 \pm 50 V	Grade I		Grade II
			Insulation resistance between parts specified in the following clauses of IS : 2628 (Part I) - 1964*		
			9.2.2 (a) 10 000 M Ω , <i>Min</i>		10 M Ω , <i>Min</i>
			9.2.2 (b) 10 000 M Ω , <i>Min</i>		100 M Ω , <i>Min</i>
Voltage proof	11.7.4	Test voltage 1 050 V (peak)			

Radio frequency shunt resistance (for Grade I switches only) 11.7.4

Measured at 10 Mc/s between two terminations not connected together

Not less than 1.5 MΩ

Capacitance 11.7.4

At 1 Mc/s

Grade I	Grade II
Capacitance between parts specified in the following clauses of IS : 2628 (Part I)-1964*	
9.5.2 (a) } 9.5.2 (b) } 9.5.2 (c) } 9.5.2 (d) } 9.5.2 (e) }	10 pF, <i>Max</i> 10 " " 10 " " 10 " " Not applica- ble
Under consideration	

Rotational torque 11.7.4

For heavy duty types: 3 kgf.cm, *Min*
6.5 kgf.cm, *Max*
For normal duty types: 1.5 kgf.cm, *Min*
4.5 kgf.cm, *Max*

Sealing normal (for sealed type only) 11.9.1

Rate of leakage shall not exceed 1 ml per hour

Fourth Lot

Endurance test 12

Number of cycles
10 000

a) Resistive circuit

$\left\{ \begin{array}{l} V = 30 \text{ V dc} \\ I = 500 \text{ mA} \end{array} \right.$

b) Inductive circuit

$\left\{ \begin{array}{l} f = 40 \text{ to } 60 \text{ c/s} \\ \text{Power factor} = 0.7 \\ \text{to } 0.8 \\ V = 250 \text{ V (rms)} \\ I = 50 \text{ mA} \end{array} \right.$

*Specification for rotary wafer switches (low current rating) : Part I Tests and general requirements.

(Continued)

TABLE 2 TEST SCHEDULE — *Contd*

TEST	CLAUSE OF IS : 2628 (PART I)- 1964*	CONDITIONS OF TESTS	TEST REQUIREMENTS		
			Category I	Category II	Category III
(1)	(2)	(3)	(4)	(5)	(6)
<i>Fourth Lot (Contd)</i>					
Contact resistance	12.5.3		20 m Ω , <i>Max</i>	20 m Ω , <i>Max</i>	20 m Ω , <i>Max</i>
Rotational torque	12.5.3			For heavy duty types : 3 kgf.cm, <i>Min</i> 6.5 kgf.cm, <i>Max</i>	
				For normal duty types : 1.5 kgf.cm, <i>Min</i> 4.5 kgf.cm, <i>Max</i>	
Voltage proof	12.5.3	Test voltage 1 050 V (peak)			
Radio frequency shunt resistance (for Grade I switches only)	12.5.3	Measured at 10 Mc/s between two termina- tions not connected together		Not less than 1.5 M Ω	
Corona	9.4				
Sealing normal (for sealed switches only)	11.9.1		The rate of leakage shall not exceed 1 ml per hour		
<i>Fifth Lot</i>					
Sealing extended (for sealed switches only)	11.9.2		The rate of leakage shall not exceed 1 ml per hour		
Mould growth	11.11				

*Specification for rotary wafer switches (low current rating) : Part I Tests and general requirements.

TABLE 3 RECOMMENDED CONTACT ARRANGEMENTS

(Clause 11.2)

TERMINATION ON FRONT SIDE					TERMINATION ON REAR SIDE				
Number of Termination	1 Pole-11 Positions	2 Pole-5 Positions	3 Pole-3 Positions	4 Pole-2 Positions	Number of Termination	1 Pole-11 Positions	2 Pole-5 Positions	3 Pole-3 Positions	4 Pole-2 Positions
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	R	R	R	R	1	S	S	S	S
2	S	S	S	S	2	S	S	S	S
3	S	S	S	S	3	S	S	S	R
4	S	S	S	R	4	S	S	R	S
5	S	S	R	S	5	S	S	S	S
6	S	S	S	S	6	S	R	S	R
7	S	R	S	R	7	S	S	S	S
8	S	S	S	S	8	S	S	R	S
9	S	S	R	S	9	S	S	S	R
10	S	S	S	R	10	S	S	S	S
11	S	S	S	S	11	S	S	S	S
12	S	S	S	S	12	R	R	R	R

NOTE — Here 'R' denotes rotor termination (pole), that is, a common termination which is capable of being connected internally to other terminations in turn, by operation of the switch; and 'S' denotes stator terminations (position), that is, that termination to which the rotor termination is capable of being connected during operation of the switch.